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QUARTERLY LETTER REPORT

Thermochemistry of Selected Compounds
Nonr-3608(00)

by

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February 15, 1966 - May 15, 1966

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Department of The Navy
Power Branch
Office of Naval Research
Washington 25, D.C.

Attn. - Mr. Richard L. Hanson, Code 429

June 15, 1966

MAJOR ACCOMPLISHMENTS

A. Aluminum Borohydride Studies

During this quarter we have continued to measure the heat of reaction of aluminum borohydride with water vapor at $\sim 2^{\circ}\text{C}$. The samples were prepared by vacuum distillation and fractionation.

The calorimeter was operated isothermally by supplying to the jacket continuously flowing, precooled water. The precooling was accomplished simply by immersing the coils (2) through which flowed the water into two large dewars filled with water-ice mixtures. Prior to assembly, all parts (bomb, jacket, calorimeter fluid) were precooled to the vicinity of 2°C . Upon assembly, the system equilibrated for a period of four hours after which time the reaction was initiated. The heat liberated was measured, the evolved hydrogen measured at the end of the run, and the appearance of the products noted.

An observation of the results to date shows the heat data to scatter to a degree not tolerable for the subsequent calculations leading to a value for the heat of formation for this compound.

We have sought the possible causes for these variations and introduced the proper modifications necessary to correct the problem. We found it necessary to replace the thermistor whose leads had come in contact with a droplet of mercury. The jacket temperature was kept at 2°C by water at a lower temperature continuously passing into it and by an electrical heating element which was automatically thrown on when the temperature

dropped below 0.012°C of the set temperature (2°C). We found a part of our trouble in the fact that variations (perhaps by stratification) in the precooling vessels caused the jacket temperature to deviate from the limits of $\pm 0.012^{\circ}\text{C}$. The construction of a thermistorized Wheatstone bridge for the monitoring of the jacket temperature was then completed and the thermistor probe inserted in the jacket. A quick mixing of the precoolers at 10 minute intervals corrected the problem as noted by the monitored temperature of the jacket water. From the results of the more recent runs following the new modifications, we are beginning to see much less scatter. We, therefore, expect the future runs to also exhibit this same degree of precision.

B. SAP Study

We have received the sample material from Aerojet General and are ready to proceed with our studies.

PROBLEMS ENCOUNTERED

None.

ACTION REQUIRED BY ONR

None.

FUTURE PLANS

We plan to continue our low temperature hydrolysis studies of aluminum borohydride and to reinvestigate the analytical study of SAP.

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13. ABSTRACT <p>We have continued with the hydrolysis studies of aluminum borohydride and attempted to locate the source of the contributing factor which has resulted in the scatter of our heat data. We feel that the main factor has been the lack of proper control of the jacket temperature which is held at 2°C. We have taken measures to monitor and to correct the deviation of this temperature from a fixed setting. From the results of the more recent runs following the new modifications, we are beginning to see much less scatter. We, therefore, expect the future runs to also exhibit this same degree of precision.</p>		

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